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ABSTRACT

The conference reported here was concerned with the problem of how to develop the kind of excellence in college biology teaching that universities have traditionally demanded in their research. Fifty-three persons from the western states attended the conference. This report contains: (1) the conference schedule; (2) a list of the participants; (3) the papers delivered by Walter D. Knight, "How to Tell the Birds from the Flowers: a critical study of the species Docturorum de rerum natura studiosorum;" and Ann M. Heiss, "Biological Students Appraise their Ph.D. Programs;" (4) comments by representatives of five institutions of distinctive features in their programs with regard to the education of teaching assistants and the improvement of teaching; (5) a statement by Frederick F. Reif describing the SESAME (Search for Excellence in Science and Mathematics Education) program and making a case for new types of degrees; and (6) reports of the working groups which concerned themselves with: (a) "a model program for making the teaching experience a learning experience for the teaching assistant;" (b) "a model program for the orientation of the new teaching assistant;" (c) "meeting the needs for college teachers at two-year and four-year institutions;" and (d) "an evaluation of a suggested way to provide higher status for teaching. (AF)

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March 25, 1970

Memo No. 70-11

BERKELEY CONFERENCE ON PRESERVICE PREPARATION OF COLLEGE BIOLOGY TEACHERS

February 27-28, 1970

"Universities demand excellence in research, but they tolerate mediocrity in teaching." -- Frederick Reif.

The conference reported here was called by the Commission on Undergraduate Education in the Biological Sciences to attack this very problem: how to develop the kind of excellence in college biology teaching that universities have traditionally demanded in their research. This conference was held at the Lawrence Hall of Science on the campus of the University of California at Berkeley.

The fifty-three people invited to attend were carefully chosen for the excellence of the contribution they might make to the conference and for the likelihood that their leadership on their own campuses and others might bring about some worthwhile change. They came from the west: From San Diego to Seattle, from San Francisco to Boulder.

Some chosen were deans, some were faculty members, some graduate students, and some were engaged in educational research. They had in common a concern for excellence in teaching and a will to get on with the job. Virtually no time was spent debating the obvious: that universities can do a better job of preparing their graduates for modern, creative

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college teaching. In the words of Dean Knight, "If there is anything else that we can do in a conference like this it is to resolve that some of the things that everyone knows ought to be done get done."

Conferees concerned themselves with the question of how best to improve the preparation of college biology teachers. As at the Michigan Conference (CUEBS Memo No. 70-3 and CUEBS News April, 1970) no one proposed a second-rate program for those unable to meet the demands of a traditional Ph.D. All insisted upon the importance of creative activity such as good research as a component of the education of university graduates. All assumed that no one can be a first-rate college teacher unless he himself is well educated.

Solutions generally followed two main channels. Since the augmented and enriched experience as a teaching assistant is the most common preparation a future college teacher receives for his life work, the education of teaching assistants was a major thrust of the conference. The other complementary approach was consideration of how the traditional Ph.D. can be modified to make possible more attention to teaching of the subject.

In case they get lost in the snowstorm of paper that blows across a department chairman's desk, a few major highlights are noted here. Be sure to read Dean Knight's warm and penetrating discussion of the role of the teaching assistant. Read Dr. Heiss's passionate plea for attention to teaching and her study of the reaction of graduate students to their preparation.

A major contribution is one of the shortest: Dr. Reif's description of the SESAME Program at Berkeley, an imaginative step in establishing impeccable quality in a Ph.D. in the teaching of science.

See the discussion of programs at selected universities. They furnish evidence that there are many approaches improving

the program and that things <u>are</u> being done to improve the preparation of college biology teachers. This exchange of ideas, by no means restricted to reports of panelists, was a major objective of the conference.

See the reports of the deliberations of the four study groups. They are packed full of good ideas assembled from the combined experience and judgement of those who have been truly engaged with the problems to be solved. We are particularly grateful that so many busy, able people from all over the west gave so generously of their time and experience. The proof of the value of the conference will be found in what happens now.

The open-handed generosity of the University of California at Berkeley in providing the human resources of the Berkeley campus and the splendid physical facilities of the Lawrence Hall of Science are greatly appreciated.

The contribution of the University of California to this conference is one more evidence of the leadership it has shown in the field of education. This leadership is greatly appreciated.

Donald S. Dean
Staff Biologist

CONFERENCE ON PRESERVICE PREPARATION OF COLLEGE BIOLOGY TEACHERS

University of California, Berkeley

FRIDAY, FEBRUARY 27, 1970

8:30 Bus pick-up from hotel

Registration - Lobby of Lawrence Hall of Science

9:00 Welcome Dr. W. M. Laetsch, Associate Director
Lawrence Hall of Science
University of California, Berkeley

Orientation to the conference

Dr. Edward J. Kormondy, Director of CUEBS
Dr. Donald S. Dean, Staff Biologist, CUEBS

9:30 How to Tell the Birds from the Flowers: a critical study of the species Docturorum de rerum natura studiosorum

Dr. Walter Knight, Dean of the College of Letters and Science, University of California, Berkeley

Discussion:

Dr. Glen E. Peterson	University of Nevada
Dr. Richard Dodge	Columbia Junior College
Mr. Stephen Webster	Stanford University
Mr. Richard Fluck	University of California, Berkeley

10:45 Coffee in lunchroom

11:00 Ph.D. Students in the Biological Sciences Appraise their Teaching Preparation

Dr. Ann M. Heiss, Center for Research and Development in Higher Education, University of California, Berkeley

Discussion from the floor.

12:15 Luncheon in Lunchroom, Lawrence Hall of Science

1:30 Possible Solution 1: Education of Teaching Assistants

Selected features of programs undertaken at five institutions followed by discussion from the floor.

Dr. Milton Hildebrand	University of California, Davis
Dr. David Norris	University of Colorado
Dr. Robert Winokur	University of Utah
Dr. David L. Willis	Oregon State
Dr. Charles Wilber	Colorado State

3:00 Working Sessions

A. Model Program for Making the Teaching Experience a Learning Experience for the T. A.

Dr. S. S. Tepfer, University of Oregon, Chm.

B. A Model Program for the Orientation of New Teaching Assistants

Dr. Loren D. Potter, University of New Mexico, Chm.

C. Meeting the Needs for College Teachers at Two-year and Four-year Institutions

Dr. Stanley E. Gunstream, Pasadena City College, Chm.

D. Consideration of a Suggested Way to Provide Higher Status for Teaching.

Dr. Robert Cleland, University of Washington, Chm.

SATURDAY, FEBRUARY 28, 1970

8:30 Bus pick-up from hotel

9:00 Possible Solution 2: The Case for New Types of Degrees

Dr. Frederick Reif, Department of Physics
University of California, Berkeley

Discussion:

Dr. Sanford S. Elberg	University of California, Berkeley
Mr. William Copeland	University of Oregon
Dr. Kenneth Pike	Arizona State University
Dr. Robert J. Jonas	Washington State University
Dr. A. Lester Allen	Brigham Young University

10:30 Coffee and visit to the Lawrence Hall of Science

11:45 Plenary session: Report of working groups

12:30 End of the conference.

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February 27-28, 1970

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HOW TO TELL THE BIRDS FROM THE FLOWERS:

a critical study of the species Docturorum de rerum natura studiosorum.

Dr. Walter D. Knight

I will talk primarily about teaching assistants, because they represent the largest body of college teachers in training in the university today. In choosing my title, I was reminded of R.W. Wood's book, "How to Tell the Birds from the Flowers," which is properly taxonomical and suggestive of theprocess of classifying and selecting teaching assistants for particular courses. In matching the man to the job, I have often thought, humorously, that some teaching assistants are like vegetables, and others are more like birds. Aside from their temperaments, however, a main consideration for us at this conference is our relationship to them as developing scholars and teachers. The following quote from Isaak Walton is suggestive:

> "Thus use your frog: put your hook through his mouth and out at his gills, and then with a fine needle and silk sew the upper part of his leg with only one stitch to the arming wire of your hook, or tie the frog's leg above the upper joint to the armed wire; and in so doing use him as though you loved him."

In this suggested style of operation, the teaching assistant is both bait and instrument for catching something, and the instructor is the fisherman. At any rate, the teaching assistant's freedom of action is severely circumscribed.

At the other extreme the teaching assistant is turned loose with a minimum of instructions or guidelines to shift for himself. Unfortunately these extremes include most typical practices,and it is a shame that so few strike a reasonable mean between these extremes, or pay attention to some fundamental problems in the development of teachers.

Now what, really, is the teaching assistant supposed to do, or be? He is partly an instrument of the instructor, partly the students' guide, partly co-learner, partly academic bookkeeper, partly explicator. These and other functions are important. However, a more general and fundamental responsibility is to foster the students' developing ability to conceptualize the matter and style of what is being taught, and to perceive the basic aims of the course. The latter are often lost in the

heirarchy of routine. It is in fact all too easy to get up in the morning, give that lecture, get on to the next one, and keep up with the syllabus without letting the students in on the payoff, if there is one. That is the infectious disease which is too easily transmitted to the next generation of teachers, and which often inhibits creative throught in the participants.

The choice of teaching assistants is important and should be done directly and personally by the instructor in charge. They must exchange ideas and attitudes toward the course. Special talents which are needed for a particular course should be sought. I am convinced that any course employing teaching assistants can stand or fall on their personal and human qualities, as well as on their professional work. In my own experience, if I have not had good teaching assistants, or if they were not properly stimulated and supervised, the course was no good. The converse is not guaranteed, but the chances are much better if the teaching assistants are good, and if they understand what they are supposed to do. The latter includes an understanding of the general aims of the department, and the specific aims of the course, as well as the interests, talents, and motivations of the students. After he has been chosen for his assignment, the teaching assistant must be oriented and trained. The fact that so few orientation programs exist, or are effective, accounts for the need of a conference like this. And the problem is not so much that we do not know what to do, but that we must resolve to do what needs to be done.

Aside from the details of training programs, more fundamental questions involve how the teaching assistant is able to convey to the students the basic aims of the course, and how the instructor in charge attends to the personal and professional development of the teaching assistant. The teaching assistants are all different, they all have ideas, and they all develop at different rates. Furthermore, their development is often rapid, and it is, therefore, difficult to keep track of them.

In the teaching seminar, certain standard techniques and certain subject matters may be discussed. But these are not enough. The seminars must indicate clearly what the department is trying to do, what the function of the elementary courses is in the department, what the structure is of the major program, and how it has developed, and finally, what literature is available for young scholars who want to read about developments in the field or in the teaching of the subject.

What I have said thus far is hardly new, but is needed as background representing a number of important features of our relationships with teaching assistants. More important, however, are two essential

aspects of the situation today, which have been insufficiently recognized. First, having begun my remarks with an implied disapprobation for turning teaching assistants loose, I must, with some irony, point out that what we actually need to do is to provide freedom within constructs which are largely self-imposed. Nowadays most teaching assistants desire to be allowed considerable freedom in the conduct of their own teaching. Individual or group projects outside the confines of the standard set of laboratory exercises, experiments or problem assignments are on their way to becoming more the rule than the exception. In this way, the enthusiasms of both teaching assistants and students are stimulated, and the learning process appears to be once more pleasurable and more effective than it is under a rigidly prescribed set of conditions and assignments.

Of course the student who spends his time in this way is exposed to a narrower range of the standard subject matter in the field. However, experience teaches us that mere exposure is not likely to last very long. The opportunity to do his own thing with some knowledgeable and sympathetic guidance produces longer-lasting effects on the student's retention of learning, on his attitude toward it, and on his habits of mind. The mere fact that both teaching assistant and student are to some extent free to design their activities together has a salubrious effect on their intellectural development and their attitude toward the entire educational process.

Second, and perhaps of most fundamental importance is the education of the professor. We talk smugly of training the teaching assistants, but when it comes to the art of communication, the professor, however erudite, is usually in an ideal position to learn from his teaching assistants, particularly in those sessions in which the latter relate their most recent experiences with their students. It is seldom that a bright student or teaching assistant fails to question in such a way as to illuminate both the subject and the teaching process for the professor who is willing and able to listen, and to respond to the reactions of the young. This is true both for questions of scientific conceptualization and also for social or practical relevance.

Perhaps I may clarify the matter by observing that the students in a science course for liberal arts students are much more likely to ask interesting questions than are the "preprofessionals." Of course some of the former students find it difficult to ask any questions at all. Yet those who do are usually sufficiently uninhibited to allow themselves to ask what may in all candor be called imaginative questions. By contrast, with a few happy exceptions, my observation is that the early training of "preprofessionals" is more likely to condition them to ask those questions which should NOT be asked, than to provide the framework and stimulation for the future creative scholar whose primary responsibility is to ask precisely those questions which much of standard instruction seems to rule out of order.

Of course I am not about to claim that the professor is likely to find many teaching assistants, or students, whose questions prompt him to undertake a new and prize-winning research problem. Nevertheless, much is to be learned from the teaching assistants, if not with regard to the basic subject matter, at least with regard to the art of communication, especially with the young.

In conclusion I will tell you a little about a handbook that I made for the chairmen of my departments. In some respects they too are turned loose and need some guidelines as to what their attitudes toward a department of the university ought to be. I incorporated in this handbook a considerable section on teaching assistants, including ideas about orientation and training, and suggestions that each department have a committee on teaching. Incorporated also was the suggestion that when a promotion case is sent forward, it should include comments with respect to the individual's performance in the area of lecturing, guidance, student supervision, teacher supervision, dealing with teaching assistants, and innovations in teaching.

For the epilogue to this document I took a small passage from Erich Fromm's "The Art of Loving," which speaks for itself:

> "While we teach knowledge, we are losing that teaching which is the most important one for human development: the teaching which can only be given by the simple presence of a mature, loving person. In previous epochs of our own culture, or in China and India, the man most highly valued was the person with outstanding spiritual qualities. Even the teacher was not only, or even primarily, a source of information, but his function was to convey certain human attitudes. In contemporary capitalistic society--and the same holds true for Russian Communism--the men suggested for admiration and emulation are everything but bearers of significant spiritual qualities. Those are essentially in the public eye who give the average man a sense of vicarious satisfaction. Movie stars, radio entertainers, columnists, important business or government figures--these are the models for emulation. Their main qualification for this function is often that they have succeeded in making the news. Yet, the situation does not seem to be altogether hopeless. If one considers the fact that a man like Albert Schweitzer could become famous in the United States, if one visualizes the many possibilities to make our youth familiar with living and

historical personalities who show what human beings can achieve as human beings, and not as entertainers (in the broad sense of the word), if one thinks of the great works of literature and art of all ages, there seems to be a chance of creating a vision of good human functioning, and hence of sensitivity to malfunctioning. If we should not succeed in keeping alive a vision of mature life, then indeed we are confronted with the probability that our whole cultural tradition will break down. This tradition is not primarily based on the transmission of certain kinds of knowledge, but of certain kinds of human traits. If the coming generations will not see these traits any more, a five-thousand-year-old culture will break down, even if its knowledge is transmitted and further developed."

BIOLOGICAL STUDENTS APPRAISE THEIR PH.D. PROGRAMS

Dr. Ann M. Heiss

I think that I would get no argument from the members of this audience if I suggest that to all intents and purposes the biological sciences have dethroned the physical sciences as the glamour fields in academia. While they achieved that distinction for their spectacular discoveries in molecular biology and bio-genetics, the biological sciences undoubtedly ride the crest of the academic popularity wave because of the great hope -- and great fear -- they hold out for mankind and for the quality of his environment. The poet, philosopher, politician and king as well as the man on the street is now pretty thoroughly convinced that biologists control powers that are as awesome as any controlled by the nuclear physicist.

For the academic biologist this is not a comfortable nor enviable position. The uneasiness which their new affluence and visibility has created was reflected in their responses to a study that was recently completed at the Center for Research and Development in Higher Education here at Berkeley. While the main purpose of the research was to study the components of quality in doctoral education, we were also interested in the scholar's views on the nature of the modern university and how he as a faculty member perceived his role in the university.

The ten institutions chosen for the study were among those identified by Cartter as being among the most prestigious graduate schools in the country. Data for the study were obtained through interviews with graduate deans, academic deans and department chairmen, questionnaire responses from approximately 1600 members of the graduate faculty and 3500 doctoral students and from responses to an attitude inventory that was administered to 1200 doctoral students who agreed to participate in a second phase of the study. Twelve basic fields of study (biochemistry, chemistry, economics, English, French, history, mathematics, philosophy, physics, physiology, psychology and sociology) were represented. The institutions included U.C. Berkeley and the

Universities of Cornell, Columbia, Johns Hopkins, Illinois, Michigan, Northwestern, North Carolina, Stanford and Wisconsin.

In keeping with the theme of this conference, I shall limit my comments to the data obtained from respondents in the biological sciences with reference to the preparation which the Ph.D. program offers for college teaching. In order to fully understand the background of the problem, a few general observations are in order.

Judging by our interview data, the biological sciences appeared to be in a dynamic state of flux. Department chairmen in these fields observed that unprecedented discoveries in molecular biology, genetics and physical chemistry will make it necessary in the future for these disciplines to resist atomization. While some foresee the development of greater differentiation and specialization, others see a return to the generalized approach to knowledge. In either event, practically all interviewees in the biosciences expect that the lines between their fields and other disiplines will get increasingly fuzzier as the former move from test-tube experimentation, toward research on the whole organism. Thus greater interdisciplinary interaction will develop. As an example of this apparent trend, one department chairman reported that in a course on cell biology that is now offered jointly by six departments in his institution, the nature of the discussions now indicates a need for an emphasis on the philosophy of science; hence, next year a professor from philosophy will be added to the group.

Department chairmen in biochemistry reported that they expect to see an increased dependency upon technology and/or the physical sciences for the development of the instrumentation which the bio-scientist will require.

In general, the graduate faculty members and department chairmen who responded to our questionnaires and interviews expressed uneasiness about the amorphous state of their disciplines and also revealed the nature of the conflict which the biologist experiences as he faces, on the one hand, a society which importunes him to be more "mission oriented" and, on the other hand, a professional field which cautions him -- especially through its reward system -- to remain discipline oriented.

By their own admission the faculties in our sample are definitely oriented around the discipline. Only 12 per cent were in favor of giving priority to mission oriented research--even in periods of great social stress or societal needs. Eighty-two per cent perceived their roles as producers of knowledge and as mentors of becoming scholars who will in turn become other knowledge producers. Ninety-one per cent of the faculty respondents said that they had accepted their positions because of the research opportunities and academic freedom their university offered.

These and other data make it clear that the career preferences of the faculty members in our sample are definitely in the direction of research. Convinced that this is the scholars' forte, they signal messages to their students -- through their attitudes, values and behavior -- that socialize their students to the belief that teaching is a less rewarding or honorific activity than research.

Because universities look upon the Ph.D. as a certification of research competency the program of study tends to center around the dissertation which becomes the tangible evidence of that competency. Few, if any institutions, require their Ph.D. students to demonstrate equal competency in teaching which forms the other part of the work equation of academics.

While 87 per cent of our sample of doctoral students in the biological sciences reported that they were attracted to their fields because of the research activity it afforded, 76 per cent also said that they wanted to teach. Among these were many who felt that they were inadequately prepared for teaching and some who were critical of the haphazard or cavalier manner in which their teaching assistantships were organized.

The duties and responsibilities of teaching assistants vary widely among institutions and among departments within the same institution. They may range in character and level from routine non-academic details to full responsibility for teaching a regular course. In many cases the duties of a teaching assistant are unspecified: he fills in wherever his services are needed. In other instances his duties are broadly defined. For example, in one large university in the

sample teaching assistants are given a written description of the office they assume as an assistant. In this statement the teaching assistant is advised that he has a three part responsibility: 1) to facilitate in every possible way the intellectual development of the individual students in his section, 2) to ascertain and carry out the aims of the professor in the development of the plan of the course, and 3) to further his own training and development as a physicist and teacher.

Some departments attempt to graduate the tasks that are assigned to teaching assistants so as to make the degree of complexity and responsibility in the task consonant with the teaching assistant's background and level of maturity. But in many cases graduates are mustered into service without any basic training or without any effort to match their competencies with the responsibilities entailed in their teaching assignment.

Sixty-one per cent of students in the biological sciences indicated that they found their experiences as a teaching assistant to be "very meaningful" or "moderately meaningful." A higher percentage described their research assistantship in these terms. The duties and activities assigned to them in research apparently contribute more to student morale than those associated with instruction. Respondents frequently commented on the enjoyment they felt in working closely with the faculty or with other assistants as they cooperatively pursued a research problem. Apparently this close relationship provides a psychological lift by virtue of the status it imparts. Students reported that the intellectual stimulation and the challenge posed by the give and take of the partnerships as they exchange or defend their ideas whets their appetite for research. Unfortunately, the converse of this is true for teaching assistants who often described their responsibilities as routine or dull.

Since the relationship between project directors and their assistants generally approximates an interaction between junior and senior partners-- or near co-equals -- the atmosphere in the research laboratory is more informal than that found in a teaching assistant's interaction with his supervisor. Thus the research assistant is more comfortable

in his role than is the teaching assistant and the latter finds it relatively easy to identify with the interests and goals of his cohorts.

While one per cent of the Ph.D. respondents in the biological sciences reported that they had been given total responsibility in planning the course they taught or assisted in, the great majority had served principally as academic choremen. In this role they served as graders of papers, lab technicians, readers or examiners. Eighty-two per cent reported that they had played no role in academic planning and nearly 50 per cent said that they had had no experience before a class. The following table shows the nature of the tasks assigned to teaching assistants during their first year of graduate study.

See table, next page.

Tasks Assigned to Teaching Assistants During Their First Year of Graduate Study

	Biochem.	Chem.	Econ.	English	French	History	Math	Philos.	Physics	Physio.	Psych.	Socio
Observation of classes	25	44	27	12	35	21	19	31	27	30	29	29
Assistance in non-teaching duties (reading, setting up labs)	Stated in Percentages: Total N=1843											
	41	73	40	18	31	34	44	37	62	49	69	53
Teaching occasional class	31	37	38	31	34	45	49	39	50	30	52	57
Conducting lecture course sections	15	28	53	25	18	62	83	49	53	19	55	64
Teaching lower division course	15	29	36	54	89	30	60	17	38	39	31	32
Teaching upper division course	11	11	9	4	8	8	1	4	10	10	12	8
Advising undergraduates	5	12	16	11	0	25	7	14	8	11	21	19
Supervising other teaching assistants	0	3	4	0	0	1	1	1	2	3	3	1

In their open ended comments on its strengths and weaknesses, approximately sixty-seven per cent of the respondents in the biological sciences reported that the teaching assistantship had increased their interest in teaching, and an equal number said that the experience had improved their instructional skills. In spite of the fact that seventy-six per cent reported good relationships with their supervisors, only fifty-nine per cent felt that they had been given enough guidance. Nine per cent felt that they had been over-supervised. One per cent thought they had been given too much responsibility without supervision and sixteen per cent lost interest in teaching as a result of their experiences.

When those who held teaching assistantships in all fields were asked in an open ended question to offer suggestions on how their experiences might have been strengthened, 1,238 responded. Of these, thirty-three per cent thought that teaching assistants should be given more responsibility, twenty-six per cent thought that their departments should emphasize the importance of teaching and provide information on various teaching methods, eight per cent thought assistants should receive higher pay. Other suggestions included (1) the acceptance of the teaching assistants into the department as colleagues and (2) a decrease in the number of credit hours for which the graduate is required to register to be eligible for a teaching assistantship. This latter complaint is based on the fact that because some institutions require the graduate to take six or eight units of course credit during the period of his assistantship he has little time in which to prepare adequately for his various responsibilities.

Thirty-three per cent of the respondents who held teaching assistantships described the experience as very helpful, another twenty-five per cent found it moderately helpful, and eight per cent described it as rarely helpful. The fact that thirty-two per cent said that they had no basis for judging the experience is disconcerting because among this group were many who said that they were interested in college teaching. Some who had been assigned teaching duties complained because they had received no supervision or

evaluative feedback from their faculty supervisors.

The programs that were rated most satisfying were those which provided experiences that were graduated in responsibility. Doctoral students were most critical of those in which a "sink or swim" philosophy prevailed, and of those in which the teaching assistant had little control over the instructional approach.

On the last two pages of their questionnaire -- which were left blank -- graduate students were invited to add any additional comments they wished to make about their graduate programs. /252 students in the bio-sciences utilized the space for this purpose (some added pages to supplement the space provided)./

Number of Open-Ended Responses on the Quality of Their Programs

(Department)	Positive response	Negative response	Total number in sample
Biochemistry	31	10	199
Chemistry	43	29	425
Economics	12	66	253
English	28	99	296
French	13	56	151
History	36	118	349
Math	10	32	273
Philosophy	13	57	196
Physics	20	34	328
Physiology	13	51	106
Psychology	45	91	365
Sociology	14	59	256

In reviewing their free comments for clues about the quality of their doctoral experiences it must be conceded that graduate students vary on a great many dimensions including, among other things, motivation, interests and commitment to the discipline required in the Ph.D. program. For this reason it would be impossible to establish the reliability and validity of their assessment without additional knowledge about them as individuals. On the other hand, the respondents were admitted to one of the most prestigious institutions in the country, and it must be assumed that those institutions secured reasonable

assurance of the ability, interest and commitment of their doctoral students prior to their admission. On this premise, and allowing for a certain amount of ad hominism, the remarks of the students who commented separately on their graduate programs were viewed as written in good faith and therefore, are illuminating for purposes of our study. At the same time, it was conceded that the absence of commentary may imply a general satisfaction with graduate study. Each of the comments was read by three persons, two of whom made a preliminary classification of the points they covered. The final analysis was made by the project director.

In general, the agony and the ecstasy of scholarship were revealed in the open ended statements of doctoral students. While many wrote appreciatively of their education, many others wrote poignantly of their disappointments. Among those who commented critically, the great majority expressed their criticism in thoughtful and temperate language. However, the sharp and acrimonious character of some statements implied that the respondent wrote in anger and in deep disillusionment. A number of the latter added the information that they were dropping out of graduate school. If those who are responsible for graduate education reflect seriously on the substance of the students' appraisal they would probably find that most of their suggestions could be profitably implemented and that most of their problems are resolvable.

When the statements were classified on the basis of their positive or negative content, the negative observations outnumbered the positive by nearly two to one. The only department about which proportionately more positive than negative comments were made was chemistry. Among the 241 statements contributed by students in the bio-sciences -- 89 were positive and 152 were negative.

When the nature of the free comments were categorized they tended to fall into five broad headings: (1) the atmosphere of the department, (2) its goals and policies, (3) faculty-student relationships, (4) the curriculum and (5) financial support.

Positive comments concerning departmental goals and policies cited such factors as the interest of the faculty in student needs, the availability of financial support, the flexibility of the program, the independence and freedom accorded to students, the informality of the atmosphere and the quality of the graduate students.

Negative comments concerning departmental atmosphere, goals and policies focused on the factors of (1) impersonality, (2) size, (3) the absence of a sense of community, (4) the lack of adequate orientation during the start of graduate study, (5) weaknesses in the communication system, (6) insufficient supervision and guidance during the dissertation and the (7) over emphasis on research preparation in contrast in preparation for teaching.

In their positive statements about the faculty, students praised their professors for their competency as scholars, their personal involvement in the financial or academic problems of their advisees, their social consciousness, their efforts to make needed research resources available to students.

Negative criticisms of the faculty focused on their (1) over orientation around research, (2) preoccupation with publishing, (3) lack of interest in teaching or preparing their students for teaching, (4) failure to provide adequate guidance or supervision during the dissertation or teaching assistant or research assistant appointment, (5) inaccessibility, (6) distant and formal attitude toward students and (7) their interest in only the brilliant or "favored few."

Comments concerning the curriculum were nearly all negative. These included resentments against (1) the foreign language requirement, (2) the rigid course requirements, (3) the length of time required for the degree process, (4) the mechanical nature of evaluation, (5) the lack of opportunity for creative approaches, (6) the high specificity of the program and (7) the restriction against study in other fields.

Students in the biological sciences dispensed nearly equal amounts of praise and reproof in their evaluation of their Ph.D. programs. However, there were greater imbalances in their appraisal of institutions and departments than the quantitative data suggest. For example, in two private institutions all the added comments about the biochemistry department were favorable, whereas in two other private schools all but one or two comments were unfavorable. For the same department in public universities few or no comments were added.

In general, student appraisals of the department of biochemistry portrayed it as a warm cocoon. In most cases, departments were small, faculty were friendly, all students held research assistantships, stipends were adequate, good facilities were available to students, and peer interaction was healthy. Respondents conveyed the impression that the biological sciences were on top of the knowledge explosion and that students shared in the reflected glory of the faculty's research.

Unfavorable comments about departments of biochemistry included the charge that the research interests of the department were too narrow and that posed difficulty for those whose interests were broad or different from those of the faculty. Some of the commentators indicated that they received greater satisfaction in working with clinicians in the medical school than with the faculty in biochemistry. Others were critical of the teaching, the inadequacies in advising, the rigidities in the oral examination and, in one case, the fact that retroactive changes had been made in the curriculum which delayed students who were already advanced.

Although physiology students appear reticent about their graduate experiences, there was a general feeling of satisfaction among those who did comment. This arose from the superior quality of the faculty, the intellectual curiosity of graduate students, the diversity of approaches encouraged, the excellent opportunity for interdisciplinary work and the good communication within the department.

The relatively few unfavorable comments were directed against the length of the program, the rigidity of examinations and, in two cases, the lack of identification with the department due to a medical school orientation in its research.

There are some clear indications that the transcendental changes in the world of ideas may soon render our traditional methods of programming graduate education inadequate for present demands much less for the needs of tomorrow's scholar. Peter Drucker's suggestion that we are in an "Age of Discontinuity" -- a time of such radical change that the past offers little guidance for coping with problems of the present or the demands of the future, finds an analog in the "Age of Aquarius" -- which the music, art, theater, and ideologies of the young generation

anticipates and celebrates as a time of great change and promise. Because universities always live between the times, the modern institution is hard pressed to respond quickly to disparate demands. Yet the discontinuities now appear to be so great that if institutions continue to tinker with reform at the level of individual departments, they may fail to adjust to the new goals, directions, alignments or organizational needs which have resulted from the new ethos that is stirring America. Most observers believe the convergence of the revolution in science and technology, with the social and cultural revolution, is destined to change the career interests and styles of tomorrow's college teacher just as the scientific revolution drastically changed your career and mine over the past two or three decades.

The weakness in most Ph.D. programs seems to center on the fact that while the program professes to educate for scholarship, in reality it trains for research. Jencks and Riesman (1968), Sanford (1962) and others observe that by emphasizing research, almost exclusively, students are steered toward their careers armed with a set of approved methods, skills and techniques; thus they are professionally geared but inadequately prepared to think innovatively about the problems in their field. There is evidence in our study that the prescriptive requirement of the Ph.D. process often cuts off the edge of wonderment and curiosity which the student brings with him by depriving him of the chance to explore independently. It also fails to provide him with the opportunity to test his ideas through teaching "about" his discipline.

As the need for more college teachers grows, and the criticism of undergraduate teaching becomes more vitriolic, the question, "Is there a need for a new doctoral degree for college teachers?" becomes more pervasive. The issue has been debated frequently and heatedly.

In the data in this study there is evidence of growing faculty support in some fields for a special degree for those who plan careers in college teaching. Among faculty respondents representing bio-sciences in the study, twenty-five per cent favored the introduction of a teaching degree in their field. Another twenty per cent were not certain of the need and fifty-two per cent opposed such a degree. Those who favored the degree agreed that it should be offered by the substantive department rather than by the School of Education and that it

should be designed for synthesizers and disseminators of research rather than for researchers per se.

These data indicate new thinking of the part of graduate faculties and may portend changes in future doctoral preparation. Up to now, most proposals for a special degree for college teachers have been met with studied indifference on the part of the graduate faculty, most of whom perceive such a degree as a dilution or diminution of rigorous scholarship and/or productive of a second-class of scholars. Almost universally, the department chairmen who were interviewed for this study were inclined to correlate a degree that is different "in kind" with a degree inferior "in quality." If a program to prepare college teachers is ever to emerge as a viable and respected degree, it will require strong and aggressive administrative leadership, effective representative support from the teaching faculty, and a political place and power within the university structure. Probably a more viable alternative would be for the Ph.D. program to include a systematic, sequential and supervised internship or program of preparation for college teachers commensurate with its program of research preparation.

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POSSIBLE SOLUTIONS 1: EDUCATION OF TEACHING ASSISTANTS

Representatives of five institutions were asked to report the distinctive features of their programs. Their remarks are summarized below.

Dr. Milton Hildebrand, University of California, Davis

"All else is secondary to increasing the dignity and importance of teaching of an academic function. There must be increased recognition and reward for teaching so that there may be sufficient incentive to take the time and the effort to do what has to be done. The only reward that really will count is to plug the teaching experience into the review procedures..."

At Davis the academic senate has sponsored a study of the nature of fine teaching and how to evaluate it. Dr. Hildebrand heads up the activity. After several years of study, the report will soon be ready. Students and faculty were asked to name the best and worst teachers and the committee then sought to discover what items truly discriminated in separating good teachers from bad. The information from this study will be used in developing an evaluation system.

Dr. Hildebrand teaches a course "The Effective Teaching of College Biology" in which graduate students do such things as design a course, prepare a budget, prepare a lecture, observe superior teachers, and prepare examinations. About 10% of the teaching assistants take the course.

Dr. David Norris, University of Colorado

The mini-institute at the University has been described in greater detail in the February,1970 CUEBS News. The institute is an intensive three-day session using biology faculty, education faculty, and personnel from BSCS for instruction. The fall experience is supplemented by monthly full-day sessions.

They hope to enlarge the scope of the institute next year to include undergraduates, graduate students, and faculty. Many of the faculty have found the seminars for graduate students quite helpful.

Next year graduate students will develop their own original laboaratory activities and try them out in the regular laboratories if all goes according to plan.

Dr. David L. Willis, Oregon State University

The General Science Department of which Dr. Willis is chairman, has charge of a general education course for 1100-1200 biology students and also has master's and doctor's programs for individuals interested in college teaching. A unique feature of their teaching assistant program is that at least half of their T.A.'s have had experience in high school or college teaching. They try to have about half of the T.A.'s aspirants to the Ph.D. degree. The rest are pursuing the master's.

A team of six senior professors, two instructors (predoctoral students), and twelve to fifteen teaching assistants handles the classes. They meet as a team weekly for prep sessions. Graduate students are encouraged to develop laboratory activities. Indeed most of the laboratory activities in use were developed or modified in some way by graduate students.

Two of the best teaching assistants each year are promoted to half-time instructorships. They make video-tapes and otherwise have the full responsibilities of senior faculty members.

There is a fall seminar introducing students to research, the department, the graduate program, etc. In the winter there is a seminar in principles of college biology, and in spring the seminar deals with the practice of what was learned in the winter.

Mr. Robert Winokur, graduate student, University of Utah

Dean Charles Monson was instrumental in developing an interdepartmental program for the instruction of selected teaching assistants with the idea that they would act as leaven in their departments. Those selected were paid $75 for the three days of participation. The interdepartmental aspect of the program was regarded as a strong feature. The provost, experienced teaching assistants, and acknowledged good teachers provided much of the input.

The micro-teaching experience available to all participants was a very popular feature. Each teaching assistant was taped as he taught a brief lesson. Some were photographed on a split-screen arrangement which permitted critics to study the expressions and activities of the class--an important measure of the success of the instructor. Each person's tape was criticized by a small group of participants. Mr. Winokur reported that "some of us went back to doing things as we used to, but at least we felt uncomfortable doing so."

A handbook for teaching assistants has been developed.

Dr. Charles G. Wilber, Colorado State University

"In our opinion, all graduate students who plan to go into college teaching should spend at least two academic quarters in a teaching laboratory under the supervision of a full-time faculty member. In our view, it is extremely unfortunate for a graduate student to spend his entire graduate career as a research assistant or as a fellow. In addition, the graduate student should be asked to give selected lectures in one of the courses.

"We have a number of programs which are in motion at Colorado State University to carry out our obligations to insure, as reasonably as we can, that our Ph.D.'s are equipped to do college teaching. This is not a new effort on our part because virtually 100 per cent of our Ph.D.'s from the Department of Zoology go on to college teaching.

"In order to do a complete job of training the graduate teaching assistant, we feel that one must look at this problem across the board. The graduate student certainly must be developed and must be given the tools which are necessary for the college level teacher. But if this is to be a well-rounded approach, the faculty involved must also be forced to keep their teaching abilities up to a peak level of perfection. Finally, the undergraduate students must be brought around to an attitude which permits learning.

"In order that our faculty will be able to maintain their teaching capabilities we encourage them to have their lectures evaluated critically by experts in the Department of Speech Arts. In order to show that we mean business we pay the bill from departmental funds.

"We have instituted a course called Teaching of College Biology (Z701). This is given at irregular intervals when theneed of the students dictates. The course covers a variety of topics such as how to conduct a conference, the sources of materials for college teachers, the logistics of large college courses and similar topics. We have generated a Handbook for Graduate Students in the Department of Zoology and this includes an important section addressed primarily to teaching assistants. The Handbook is revised each year with the assistance of teaching assistants who actively help to re-edit the Handbook.

"The Department of Speech Arts has agreed to keep going a special course for potential college teachers. This course is aimed at improving platform presence of a person who is giving a college level lecture.

"Central to all this is what we call on-the-job training for all our graduate students. This effort includes the NDEA and NSF fellows as well as the graduate teaching assistants. All these are required, as part of their graduate development, to spend time in actual teaching. We do not pay these individuals any more than the University pays people who are required to go through practice teaching exercises if they want to become primary or secondary school teachers. We feel that it is an integral part of their program; it is not another device for obtaining help at low cost.

"Several years ago we launched a large seminar open to anyone in the university community who wished to attend. It was focused on problems of college teaching. The meetings were held once a week at noon for each of three quarters of a year. The attendance varied between 200 and 300. This somewhat startled us, but it also indicated widespread interest among graduate students and faculty with problems of teaching. We have

now turned this seminar over to our Office for Instructional Development. It became obvious that it was entirely too large for a single biology department to handle.

"We are now proposing to use the 10-day period before the start of classes for a course of training primarily designed for teaching assistants. We hope to brief the assistants on some general principles of teaching, but more specifically we want them to go over the syllabus of the course, and go through the experiments they will supervise in the teaching laboratories. We also would like to have them begin preliminary outlines of any lectures which they may be asked to give in the courses in our department.

"Are there any special amenities which our graduate teaching assistants are given? We try to guarantee them a private office so that they have a certain status in the eyes of the students. We also obtain a faculty parking sticker for them. These are small matters but they are important to a teaching assistant."

POSSIBLE SOLUTIONS 2: THE CASE FOR NEW TYPES OF DEGREES

Dr. Frederick F. Reif

Note:

Various alternatives to the traditional Ph.D. have been proposed. The Ph.D. in Science Education at Berkeley was described by Dr. Reif as one possible way to improve preparation of college teachers.

Dr. Reif and colleagues have risen to the urgent challenge of the times by launching a program called SESAME (Search for Excellence in Science and Mathematics Education). This is an endeavor to bring together students and faculty, not only intellectually gifted but possessed of a pioneering spirit. Recognizing that the development of imaginative new educational methods and technologies will require first-rate talent of the sort too infrequently attracted to educational matters, Dr. Reif and his associates have deliberately set about developing a program attractive to the kind of person most likely to make a difference in modern education.

The SESAME Program has been in operation about a year. It is described in a paper by Dr. Reif published in the March 1970 Newsletter of the Commission on College Physics (No. 21) as follows:

> The purpose of this Program is to enlist the talents of some of the faculty members of the regular science departments to do research or development in curricular innovation and in the exploitation of modern educational techniques and to prepare students, highly trained in a particular scientific discipline, to pursue such educationally innovative tasks in their future careers.
>
> Administratively, the SESAME Program functions like a regular department, but consists of faculty members from several of the existing science departments (encompassing the physical and biological sciences, as well as mathematics). The SESAME Program is thus under the direct jurisdiction of the Dean of the Graduate Division and is not under the aegis of the School of Education (although it

> maintains some liaison with that school). To be admitted to the SESAME Program, a student must have a master's degree (or equivalent) in a particular scientific discipline. As part of his graduate training the student must then obtain in his discipline a degree of competence comparable to that attained by an ordinary Ph.D. candidate in that discipline. In addition, he must obtain some acquaintance with modern educational developments and acquire some teaching experience. The Ph.D. thesis of the student consists then of some research or development project dealing with curricular innovation or with the exploitation of new educational techniques. Upon completion of his thesis, the student is awarded the degree of "Ph.D. in Science(or Mathematics) Education."

At the CUEBS Berkeley Conference Dr. Reif described his program and continued with a discussion of the problems as follows:

> First of all, no matter what kind of program you set up to improve education, to inject more innovation and more talent than in the past, one of the great limitations is the extent of faculty commitment. It is very easy to get faculty commitment to the extent that the faculty member says, "I have an interest." But that is very different from getting the commitment that says, "I am actually sufficiently interested to devote a good part of my professional career to an undertaking of this kind, and to supervise graduate students." This is an intrinsic limitation and it implies that the number of students we can accommodate, even if many were available, is limited by the number of faculty members sufficiently committed and interested in educational questions to be willing to supervise students.
>
> The second difficulty you have to face in a program is that of attracting good students. I think it is traditional that, for historical and social reasons, the minute you mention education you tend to attract all kinds of people who can't make it elsewhere. When you establish a new program and try to make it good, you have all kinds of applicants who

have dropped out of some other program, or who cannot pass the qualifying exam. They have been around for years and, somehow or other, have to get a union card. I think that the answer to this problem is that you just have to broadcast widely the fact that the program is available, encourage lots of applications, and be very selective. The aim is to have good students, students with the same level of capability and talent as get attracted to science departments.

Another difficulty is the university tradition. The existing tradition is, of course, that the university is very much interested in excellence in research and is quite content with adequacy in education. We have here a double standard. This means that the institution is willing to tolerate mediocrity in education, but is not going to tolerate mediocrity in research. This tradition has a very real effect: it makes it more difficult to attract excellent talent to education because of where the rewards are located. When we set up a new program like ours, although nominally the university encourages it (the university approves of the new plan, and backs it with its prestige), the tradition and double standard have not been changed. The new program does not automatically overcome the university tradition of not wanting to invest good quality effort in the educational task.

Another problem which arises is internal. When you set up a new program and try to get scientists seriously interested in educational questions, to what extent can you control the quality of their efforts? After all, it is quite easy for a faculty member to say, "I am very much interested in an idea. I assume it is a nice project for students." But maybe the idea is not very good. After all, he may not be an expert in the area; he may not have done too much in education or thought too deeply about the questions. How do you control quality? You have to be very careful to maintain the standards.

Consider now another question which arises. Suppose you establish your new degree, that you establish optimum conditions for the students, and that you have high quality of output. Nevertheless, the legitimacy of

the degree itself may be in doubt because the degree has never been awarded before. When someone comes out of Berkeley with a Ph.D. in science education, what does this degree mean? Is it acceptable for a faculty position or is it not? To what extent would it be acceptable? What kind of job would the graduate get? Now, one should be able to say with good justification: "A position for which he is excellently qualified is a position in good four-year colleges, or even in some universities." But this is not actually guaranteed to happen.

To illustrate the problem, I would mention my experience at a conference much like this one. It was attended by representatives of quite a few four-year colleges and dealt with the problem of the preparation of college science teachers. The question that I posed in trenchant form to highlight the problems was: "We talk about the preparation of college science teachers. We talk about the desirable qualities these people ought to have. They ought to be very knowledgeable about their science, with good perspective of the field, with teaching experience. They should be creative. They ought to have <u>all</u> of these qualifications. You complain that the universities often do not produce candidates who have these marvelous qualities. Let us imagine an ideal world and have a university with a special degree program which attracts gifted students who are very innovative and very creative, with very good knowledge of the field. They not only like to teach, but to develop new curricular materials, to be intellectually alive--all of these beautiful properties. Let us give them a special degree like Ph.D. in Science Education--would you hire them?"

The answer was, "Probably not if they don't have a Ph.D. degree. What we really want is the Ph.D. degree." If this is the prevailing attitude, one has to ask oneself the question: "What is the relation of current stereotypes to reality?" If one is interested in effecting certain ends, one ought to look specifically at the ends one has in mind or one may be misled by the stereotypes. I think the fact that the stereotypes exist is an obstacle to any special degree program.

The one stereotype I have mentioned is the stereotype which pays all attention to the name "Ph.D. degree"

and fails to look at the actual qualifications of the person. Another kind of stereotype is this one: It is striking to me that quite a few small colleges insist upon doing some kind of research, even if the facilities they have are inadequate to do it well. Yet they neglect educational innovation, something that they could do superbly. They have splendid opportunities here since the number of their students is not too large. Some of the things they could do could also be exported to other institutions. They fail to pursue excellence in the area where they could pursue excellence effectively and insist (for various other reasons, partly tradition and fashion) on doing things they can not do well.

Another kind of myth which exists is the fact that research per se keeps a faculty member intellectually alive. Now it may or may not be, but I think one should not judge whether someone is intellectually alive on whether or not he does research. After all, most of you know persons who turn out one or two research publications per year--perhaps on X-ray crystallography. Every year they determine one or more crystal structures. They have a steady stream of publications. Everyone nods his head approvingly, rewards the faculty member, and promotes him. He is "a creative scientist." But this does not mean that he is consumed with curiosity or brings such curiosity to the teaching in his classroom. He may be ignorant of pulsars, quasars, masers, all of these things you see in newspapers. They are exciting, but they have nothing to do with X-ray crystallography. He does not know about them. There is thus an important distinction between having active intellectual curiosity or just turning out research. One does not necessarily guarantee the other. Things should be evaluated on their merits.

Another kind of stereotype is the confusion between the excellence of institutions and the excellence of individuals. This is reflected in the attitudes of the places that do the hiring. Usually, the institution wants to get a person who is pretty good in research and pretty good in teaching. In this case, the institution will become one where people are pretty good in research and pretty good in teaching; but it will not be an institution that is excellent in either area. On the other hand, one can conceive an institution where there are some persons who do excellent research;

they are intellectual leaders in their fields, but maybe absolutely impossible in teaching. Then there may be other persons who are excellent in educational matters--leaders in their field. Note that in this case the institution as a whole would indeed be an excellent institution. Excellence might be found in a faculty with some differentiation of functions. Individuals are not excellent in everything. Again, if one wants to abandon the stereotype, one should examine individuals, including people from special degree programs, on the basis of their individual merits: What is the individual capable of? How creative is he? How much intellectual curiosity does he have? How much leadership can he provide for the area? Universities should strive for real excellence, rather than pursue some diffuse stereotypes notions about faculty members.

The reason I have outlined difficulties is that they exist in any special degree program you set up. If you want to be actively involved in setting up a special degree program, these problems become quite important. You have to worry about setting up quality control, about what goes into the program, about the quality of the students you attract, about the job placement of the students. These problems are real and you have to face them.

The main problem is to what extent you can pay adequate attention to teaching and the educational function and to what extent you can attract at least a few persons with first-rate talent and creativity. Take for example, the Berkeley program. Its success is by no means assured and the difficulties I have mentioned militate against its success. Indeed, it will only have success--even limited success--provided it can overcome these difficulties. Nevertheless, the need to bring talent to education is worth pursuing, both at Berkeley and at other institutions, because the attention paid by such institutions to teaching and education will improve quality in these areas, will make these activities seem more legitimate and will encourage other institutions to follow suit. If some universities, especially the more prestigious ones, move in this direction, they could make one of the most effective contributions to the advancement of education by attracting to this area the kind of high-level talent which has traditionally not been concerned with emotional problems.

Working Group A: Model Program for Making the Teaching Experience a Learning Experience for the Teaching Assistant.

Participants: Allen, Anderegg, Copeland, Davis, Hague, Harris, Hildebrand, Palmblad, Savage, Winokur,

S. S. Tepfer, Chairman

A: Attitudes toward teaching

1. The contribution of the T.A. must be recognized throughout the institution and department as an important part of the system.

2. The T.A. should have opportunity for full participation. He should be required to prepare and give lectures, participate in course planning, help write and grade examinations. He must share in the responsibility for the course.

3. Potential as a teacher should be considered in hiring of T.A.'s. Those recommending them should be asked to rate their potential as teachers. Those who will not be competent teachers should not be chosen.

4. Teaching duties must be integral to the Ph.D. program--not merely peripheral. The professor supervising the must recognize that teaching is important. He should allow the student to become fully involved in his teaching.

B. A special training course

1. Attention should be given to general matters that apply to all courses: how to hold discussions, write examinations and give grades. "Pat" techniques should be avoided. The T.A. needs to develop confidence in himself.

2. Teaching assistants should be exposed to high quality models--in person and via videotape. Former successful T.A.'s should be taped in action. The professor should run a laboratory to show he does it. The T.A. should be videotaped for analysis of his program .

3. Information on various new methods should be presented--audio-tutorial laboratories, computer assisted instruction, TV lectures, and others which may not presently be in use at the university. Through demonstration and criticism, the T.A. should come to know the limitations of various techniques.

4. Help from the School of Education should be sought. They can help in the evaluation of our methods and tell us how to achieve certain competencies we desire.

5. Validity - not just reliability - in instruction and testing should be emphasized.

6. The T.A. should get some information that will help him when he is asked by students for personal advice: fainting, suicide, etc.

C. Training and prep sessions

1. There should be weekly prep sessions to discuss objectives and the progress of discussion sections and laboratory sections.

2. The T.A. must learn to do laboratory preparations, but he must not be burdened with routine repetitious work. He should be provided support personnel. The professor should participate with the T.A.'s in preparations.

3. The T.A. should be asked to evaluate the course, the professor and his own performance.

4. Every professor in every course should hold regular sessions with his T.A.'s to maintain a constant feedback.

5. The new T.A. should have help from an experienced person in planning his first performance.

D. Original Performance

1. T.A.'s should be encouraged to take responsibility to innovate. They should try new and better laboratory materials--possibly on an experimental group.

2. T.A.'s in small groups should be encouraged to plan and offer a full-length course or mini-courses of one or two weeks.

3. T.A.'s should lead the undergraduate into the library and give him help in how to use it.

4. T.A.'s should run evaluation sessions with their own students. They should seek immediate feedback under unthreatening circumstances from peers, from the professor, and from students via comment boxes, etc.

Working Group B: A Model Program for the Orientation of New Teaching Assistants

Participants: Doyle, Kammer, Langham, Lenhoff, Machlis, Peterson, Romey, Sanders, Ward

Chairman: Loren D. Potter, University of New Mexico

It was recognized by members of the working group that details of an orientation session for new T.A.'s would vary for different universities depending on such factors as size, degree of specialization, and educational goals. There was agreement that a pre-semester session of several days to a week should be held in the fall for all new T.A.'s. In the case of long sessions, extra renumeration should be made available for the attendees. Assistance in conducting the program directed by concerned faculty, could include several experienced T.A.'s selected for their excellence of teaching the previous year and paid for their assistance.

Four areas of emphasis of an orientation session might include: teaching, general orientation, reference materials, and continuing effort.

Teaching:

It was agreed that the most effective presentation of the department philosophy of education and its goal of teaching would be through the medium of actual laboratory experience.

1) A variety of laboratory experiments or exercises each representing a different teaching approach or technique should be selected by faculty and T.A.'s. The experienced T.A.'s would prepare and conduct a portion of (rarely an entire) laboratory exercise using the new T.A.'s as students. The type of learning experience anticipated and the philosophy of the educational method employed should be explained and discussed. Provision should be made for question and answer participation.

The variety of exercises selected should allow for the incorporation of all types of technical aids which would be presented in the context of their proper use in a teaching-learning experience rather than as demonstration of equipment.

2) The new T.A.'s may then each present some portion of a laboratory exercise with a brief discussion relative to its merits as a learning experience. Of value here would be an audiovisual tape which could be reviewed by the presenter and a faculty member or by the entire participating group. Helpful suggestions at this stage could be invaluable. A repeat of this filming and review later in the semester as a comparison would be a good idea.

3) If time permitted, it might be appropriate for an experienced T.A. or professor to conduct an entire laboratory period which illustrated unique learning opportunities and teaching techniques. Commentaries on goals, methods, pitfalls, objections, and advantages would be helpful.

4) Recognizing that the new T.A. can learn the subject matter and techniques more easily than the art of discussion, it is recommended that the session include someone expert in group sensitivity and discussions. Examples should be demonstrated for the T.A. to improve the learning experience in discussions with an individual student and with an entire class. Here, as elsewhere, well prepared audiovisual tapes may be used as illustrations. Much of the emphasis will be to develop the attitude of the T.A. to ask good thought-provoking questions and to give non-authoritarian type answers which will stimulate further inquiry.

5) Teacher-Student Relationships. The many techniques and niceties which help to overcome the barriers between student and instructor should be emphasized. These include early recognition and use of names, recognition and use of personal attributes and strengthening of weaknesses, and feeling of personal interest and concern. Although some teaching techniques can be learned and most T.A.'s do try to emulate a favorite professor, each T.A. must

be made to realize that with experience and maturity he will develop a combination of techniques compatible with his personality and character.

6) Teaching Assistant responsibilities.

There should be an understanding of the extent of authority and latitude allowed the T.A. The degree of divergence may vary widely with the course, with the teaching group, or with each week's laboratory. Allowance for the T.A. to teach at least some laboratory exercises with his own diversity provides satisfaction to the T.A. and variety for the student.

7) It may be necessary after the above experiences to summarize briefly the philosophy of the goals of higher education in general, those of the department, and those of the course.

General Orientation:

To hasten the effectiveness and increase the knowledge-ability of the resources available to the T.A., he should be oriented to the following:

1) Facilities available within the university and within the department, e.g. technical assistance, audio-visual equipment, and services, stockrooms, etc.

2) Personnel including storekeepers, animal room caretakers, secretaries, administrative assistants. Introduction to faculty members in an informal discussion of their disciplines at luncheons may be desirable.

3) Procedures of operation within the department and within the university should be clarified to save the T.A. time, and increase his effectiveness both as a faculty member and as a student.

Reference Materials.

1) After several years experience a handbook or guide for T.A.'s may be prepared by the department.

2) References on teaching, such as "Teaching as a Subversive Activity","Education and Ecstasy", and CUEBS materials should be made available.

3) Some universities have prepared packets for all incoming T.A.'s which include such materials as key orders; office and laboratory assignments; departmental policy on absences, cheating, evaluation, etc.; availability of supplies and facilities; academic procedures; and general university information.

Continuing Effort.

Before the orientation session is concluded, there should be an understanding of the continuing effort for improved teaching to be conducted throughout the year. The orientation session should include not only teaching assistants but any graduate or undergraduates who will be teaching.

Working Group C: Meeting the Needs for College Teachers at Two-Year and Four-Year Institutions

Participants: Abell, Dodge, Olsen, Pike, Pratt, Scudder, Webster, Wilber, Willis

Chairman: Stanley E. Gunstream, Pasadena City College

The preservice training of biology teachers for two-year colleges is especially pertinent in view of the rapid growth of two-year colleges across the nation. There are over 900 now, and they are being created at a rate greater than fifty-two a year.

With the two-year college educating an increasing number of students for their first two years prior to their transfer to the four year institution, the major employment opportunity for college biology teachers will be at the two-year college. In view of this, we addressed ourselves primarily to the training of biology teachers for the two-year college. Much of this is pertinent to the small four-year college.

Basically, the desirable fundamental teacher qualities are the same, regardless of the level of instruction or type of institution, but teachers in the two-year college must really want to teach and interact with students; and their biological training must be broad-based.

Nearly all biological courses taught at two-year colleges are introductory courses. A doctorate program which was discussed this morning by Dr. Reif would be extremely interesting for this type of individual, but the majority felt that the Ph.D. is preferrable and more acceptable, especially if teacher training is incorporated into the program. The Ph.D., because of his research experience and success in the system, is better able to relate with and provide guidance for students just beginning his biology training.

It was suggested that a modification of the dissertation research be made, not in rigor, but in emphasis so that it may be more useful to the prospective teacher. Dr. Willis indicated that Oregon State has tried this but not too successfully--in his experience graduate programs oriented toward biology teaching are not highly regarded by discipline-oriented departments.

A major portion of our discussion centered on the feasibility of establishing an internship program similar to that utilized by the medical profession and the entire group was enthusiastic about the prospects. NSF proposed a similar program a couple of years ago.

Such a program would have these characteristics:

1. The student participates in teaching seminars, workshops, and hopefully lab instruction prior to the internship program - perhaps even before he receives his bachelor's if he is properly identified.

2. The intern is assigned to a two-year and four-year college--it could be on the basis of half-day sessions, several days a week; it could even be on a quarter or semester basis. The graduate student could take the place of a professor on leave from the two-year institution, who may be going back to the four-year institution for additional work. It can also be done, of course, without such an exchange.

3. The graduate student teaches a total course in a real life situation - with guidance and evaluation.

4. The university receives immediate feedback on the quality of product.

5. The intern has actual teaching experience before starting his first regular assignments.

6. Faculty relationships of associate institutions will be improved, leading to further dialogue on mutual problems.

Problems

1. Funding - intern on university stipend? NSF? How is this going to be handled?

2. Prevention of exploitation on both ends of the spectrum.

3. How do we provide internship without interferring with the normal research activities of the graduate student?

However - if this suggestion has merit - we suggest that AIBS develop a model for the program to facilitate implementation.

One other related suggestion:

> Exchange of faculty between university and two-year colleges and four-year colleges will provide a broadening perspective of both individuals involved and the departments involved and should be of value to teacher training programs.

Working Group D: Evaluation of a Suggested Way to Provide Higher Status for Teaching.

Participants: Borg, Flexor, Jonas, Lattin, Moody, Norris, Purves, Shugarman

Chairman: Robert Cleland, University of Washington

We recognize the importance of improving the status of teaching; without such improvement we will have difficulty persuading young faculty to devote significant amounts of time and effort to teaching instead of concentrating on research. The question is, though, how do we accomplish this.

Dr. Borg has suggested that one way might be for NSF to offer a prestigious "NSF Professorships" in teaching. These professorships would be awarded through national competition to persons who have demonstrated their creative ability by being active, current leaders in their field. These professorships would provide resources in that the person could devote up to three years working on some innovative aspect of teaching. Dr. Borg suggested that the value of such a program would be two-fold; it would increase the status of teaching in the eyes of younger scientists by showing them that distinguished scientists are interested in teaching, and it would result in teaching innovations which could be used by persons of the same or other institutions.

The panel was nearly unanimous in its disapproval of this plan. The reason for this lack of interest by the members of the panel include the following. Doubt was expressed that any real "product" in terms of usable innovations would in fact come out of this program. Experience with the already existing Science Curriculum Development Program has suggested that longer periods and more money are needed to achieve significant results. Furthermore, the SCDP is already able to achieve these goals. Doubt was expressed that such professorships would, in fact, increase the desire of younger scientists to spend time teaching. There was some uncertainty as to how these professors would be selected, but the impression was left that a major and important criterion would be eminence in the man's own research area, in other words, in order to obtain this position one would have

to make certain that he emphasized his research in his junior years. Some members felt this would not act as an inducement for good, young scientists to leave the lab and give real time and effort to teaching.

There was also some question as to whether scientists who are "leaders" in their research fields are really the ones most likely to be innovative in teaching. The question was also raised as to whether distinguished teaching awards or professorships should not be given by the universities rather than by NSF.

A discussion of alternative ways to increase teaching status indicated that one important facet of this problem is the need to determine the quality of teaching. Evaluation of teaching, it was suggested, must make use of student opinions, perhaps at the close of their college career when they could look back with less anger at the teaching, but also must depend on evaluation by colleagues, especially in the matter of course content and accuracy. The subjectiveness of teaching evaluation is bothersome to us all, but it was pointed out that all evaluations including research evaluations are subjective.

In short, we have no easy answer to the problem of status for teaching, but do not feel that the proposed NSF professorship program is the right answer.

The Proposal Discussed by Group 4:

TOWARD HIGHER STATUS FOR TEACHING

"We will move much more rapidly toward solutions of problems of science education when we find ways to persuade our most creative scientists to spend a significant amount of their time, thought and energy on educational problems. Clearly the present scheme of things leads to greater and more tangible rewards from research than from teaching with the result that the bulk of the best talent tends to regard research as the desired major activity. Thus, even though a great many people enjoy teaching as such, they spend far more of their efforts on the research which leads directly to the scientific esteem and the rank and emoluments which we all value.

"If teaching and the whole educational process are to get the attention they deserve from creative people, then teaching must be made competitive with research in terms of the rewards it brings. Is such a transformation even possible? We need to find out. Within the National Science Foundation several of us have discussed one move in this direction, namely, a program of National Science Foundation Professorships to be awarded to outstanding scientists who wish to spend full or part time, say for three years, on innovative teaching projects.

"In our informal talks we have visualized a prestigious program of professorships at least equivalent in honor to the NSF Senior Postdoctoral Fellowships and Guggenheim Fellowships. Awards would be made to first rank scientists probable drawn from among those who hold the rank of associate professor or higher and those who hold distinguished chairs. A typical plan of action might be to spend half time or more for one year devising and writing up an improved way of presenting a course or courses, following this with a year or so of classroom testing and revision, and a final year of further testing if needed plus preparation of material for general publication. Originality in planning would be encouraged. Support might be provided in the form of salaries for the professor and required assistants plus travel, materials, and other expenses directly connected with the project.

"Details aside, the object would be to draw into teaching activity those leading creative scientists who are the pace setters, those people who set standards and who are widely emulated by colleagues, especially younger ones. Such a commitment to teaching on the part of outstanding scientists should raise the stature of this activity in the minds of administrators as well as faculty and assist in obtaining for teaching a full measure of the rewards now available mostly through research.

"This suggestion, outlined so very briefly, is in the talking stages. We solicit comments and questions on the general idea."